

Same drug, different results: MUHC researcher on the path to personalized medicine

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Minor genetic differences between individuals change the effect of a common medication, study shows

Medicine has moved a little bit closer to the era of tailor-made treatments, based on the unique genetic profiles of individual patients, according to recent research conducted by Dr Rima Rozen of the Research Institute of the McGill University Health Centre (RI MUHC) at the Montreal Children's Hospital and McGill University. Her study, published June 18 in the journal *Pharmacogenetics and Genomics*, shows how minor genetic differences between individuals alter the way a common drug affects the body.

Rozen has measured the impact of Methotrexate -- a drug that inhibits the metabolism of folate -- on mice with an altered MTHFR gene, which is a gene crucial for folate metabolism. The results were striking: after treatment with Methotrexate, mice with the altered gene had approximately 20 per cent less hemoglobin and red blood cells than their counterparts with non-altered genes. The altered mice also showed increased susceptibility to liver and kidney damage following treatment.

"We know that these results are applicable to humans because a parallel mutation in the human MTHFR gene affects human folate metabolism similarly. The results demonstrate that medication affects subjects differently according to individual genetic traits," Dr. Rozen explained. "And tests exist to detect this mutation." Genetic testing would allow

physicians the modify treatment based on each patient's personal genetic makeup, limiting potential side effects.

In earlier studies, Rozen's laboratory cloned the MTHFR gene and identified the common variant which interferes in folate metabolism in human populations. Between 10 and 15 per cent of the total caucasian population have two copies of the variant in MTHFR. Folate, a form of water-soluble Vitamin B2, is essential to the production of red blood cells and provides protection against spina bifida, other birth defects, and heart disease. Patients with cancer or auto-immune diseases are often treated with medications that affect folate metabolism, but physicians are not trained to verify how patients naturally metabolize folate, even though this could be an important factor in effective treatment.

"This is a first step towards personalized medicine that is based not only on symptoms but also on the patient's own genetic 'baggage,'" Rozen said. "This trend definitely represents the medicine of the future."

Source: McGill University Health Centre

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